

AMENDMENTS TO THE CLAIMS

1. **(Currently amended)** A multilumen catheter for directing the flow of blood through a patient through a single cannulation site, said catheter comprising:

a catheter body having a proximal end, a first distal end, and a second distal end, said first distal end extending distally farther from the proximal end than the second distal end;

a first lumen having a first cross-sectional area and extending between said first distal end and said proximal end;

a second lumen extending between said second distal end and said proximal end and having a second cross-sectional area that is not substantially larger than the first cross-sectional area; and

a redirecting tip positioned at the distal end of one of the lumens and configured to redirect ~~at least a portion~~ substantially all of the blood flow exiting said lumen in a direction generally opposite of the direction of flow in the lumen.

2. **(Currently Amended)** A multilumen catheter for directing the flow of blood through a patient through a single cannulation site, said catheter comprising:

a catheter body having a proximal end, a first distal end, and a second distal end, said first distal end extending distally farther from the proximal end than the second distal end;

a first lumen having a first cross-sectional area and extending between said first distal end and said proximal end;

a second lumen extending between said second distal end and said proximal end and having a second cross-sectional area that is not substantially larger than the first cross-sectional area; and

means for redirecting ~~at least a portion~~ substantially all of the blood flow exiting said lumen in a direction generally opposite of the direction of flow in the lumen.

3. **(Canceled)**

Appl. No. : 10/078,283
Filed : February 14, 2002

4. (Currently Amended) The multilumen catheter of Claim [[2]]¹ wherein the redirecting means tip comprises a J-tip.

5. (Canceled)

6. (Currently Amended) ~~The multilumen catheter of Claim 5,~~ A multilumen catheter for directing the flow of blood through a patient through a single cannulation site, said catheter comprising:

a catheter body having a proximal end, a first distal end, and a second distal end, said first distal end extending distally farther from the proximal end than the second distal end;

a first lumen extending between said first distal end and said proximal end adapted to fluidly communicate with the patient;

a second lumen extending between said second distal end and said proximal end adapted to fluidly communicate with the body independently of the first lumen; and

a redirecting tip positioned at the distal end of one of the lumens and configured to redirect substantially all of the blood flow exiting said lumen in a direction generally opposite of the direction of flow in the lumen;

wherein the second lumen is positioned coaxially with the first lumen and has a diameter greater than the first lumen.

7. (Currently Amended) ~~The multilumen catheter of Claim 5, further comprising~~ A multilumen catheter for directing the flow of blood through a patient through a single cannulation site, said catheter comprising:

a catheter body having a proximal end, a first distal end, and a second distal end, said first distal end extending distally farther from the proximal end than the second distal end;

a first lumen extending between said first distal end and said proximal end adapted to fluidly communicate with the patient;

a second lumen extending between said second distal end and said proximal end adapted to fluidly communicate with the body independently of the first lumen; and

a third lumen in fluid communication with the second lumen, said second and third lumens being positioned radially around the first lumen in a housing that surrounds said first lumen, the combined cross-sectional area of said second and third lumens being not substantially different from the cross-sectional area of said first lumen.

8. **(Currently Amended)** ~~The multilumen catheter of Claim 7, further comprising~~ A multilumen catheter for directing the flow of blood through a patient through a single cannulation site, said catheter comprising:

a catheter body having a proximal end, a first distal end, and a second distal end, said first distal end extending distally farther from the proximal end than the second distal end;

a first lumen extending between said first distal end and said proximal end adapted to fluidly communicate with the patient;

a second lumen extending between said second distal end and said proximal end adapted to fluidly communicate with the body independently of the first lumen;

a third lumen in fluid communication with the second lumen, said second and third lumens being positioned radially around the first lumen in a housing that surrounds said first lumen; and

a fourth lumen in fluid communication with the second and third lumens, said second, third and fourth lumens being positioned symmetrically radially around the first lumen in a housing that surrounds said first, the combined cross-sectional area of said second, third, and fourth lumens being not substantially different from the cross-sectional area of said first lumen.

9. **(Currently Amended)** A method of using the multilumen catheter of ~~claim~~ Claim 6 comprising the step[[s]] of directing the ~~first lumen catheter~~ catheter through a patient's vasculature~~the vessel~~, thereby permitting a user to draw blood through the second lumen and redirect said blood into the first lumen.

10. **(Original)** An extracardiac pumping system for supplementing blood circulation through a patient without any component thereof being connected to the patient's heart, the extracardiac system comprising:

Appl. No. : 10/078,283
Filed : February 14, 2002

a multilumen catheter having at least two lumens therethrough, each lumen having a distal end configured for insertion into the patient's vasculature and a proximal end, at least two of said lumens being in fluid communication with each other at their proximal end; and

a pump secured within one of the lumens and configured to pump blood through the patient at subcardiac volumetric rates, the pump having an average flow rate that, during normal operation thereof, is substantially below that of the patient's heart when healthy;

whereby the pump may be operated to pump blood from one location in the patient's vasculature to a different location in the vasculature while the proximal end of each lumen resides outside the patient's body.

11. **(Original)** The extracardiac pumping system of Claim 10 wherein the multilumen catheter further comprises at least one aperture in one of the lumens positioned in the lumen distal from the distal end so that the aperture may reside within the patient's vasculature and close to the point of insertion when the multilumen catheter is inserted into the patient so that the aperture may maintain or enhance perfusion of blood to the patient's vasculature downstream of where the aperture resides in the vasculature when the catheter is inserted into the patient for treatment.

12. **(Original)** The extracardiac pumping system of Claim 10 wherein the multilumen catheter further comprises an additional lumen configured to be positioned entirely within the patient's vasculature.

13. **(Original)** The extracardiac pumping system of Claim 10 wherein at least one lumen of the multilumen catheter is longer than at least one other lumen.

14. **(Original)** The extracardiac pumping system of Claim 10 wherein the distal end of at least one lumen is tapered.

15. **(Original)** The extracardiac pumping system of Claim 10 wherein the multilumen catheter further comprises at least one aperture positioned proximal a distal end of at least one of the lumens.

16. **(Original)** The extracardiac pumping system of Claim 10 wherein the multilumen catheter further comprises a radiopaque marker, wherein the radiopaque marker can be used to position the catheter when the catheter is applied to a patient

17. **(Original)** The extracardiac pumping system of Claim 10 wherein the multilumen catheter further comprises a redirecting tip positioned at the distal end of one of the lumens and configured to re-direct at least a portion of the blood flow exiting said lumen in a direction generally opposite of the direction of flow of the blood through that lumen.

18. **(New)** The extracardiac pumping system of Claim 10 wherein the pump is secured entirely within one of the lumens.

19. **(New)** The multilumen catheter of Claim 1, wherein the redirecting tip further comprises a surface positioned at the distal end of and within one of the first and the second lumens, the surface configured to redirect substantially all of the blood flow exiting the lumen in a direction generally opposite of the direction of flow in the lumen.

20. **(New)** The multilumen catheter of Claim 19, wherein the redirecting tip is positioned at the distal end of the first lumen.

21. **(New)** The multilumen catheter of Claim 20, wherein the surface extends across the first lumen between a side of the lumen and a longitudinal axis of the first lumen.

22. **(New)** The multilumen catheter of Claim 19, wherein the surface substantially prevents blood from flowing beyond the surface in the lumen in which the surface is positioned.

23. **(New)** The multilumen catheter of any of Claim 19, wherein the lumen in which the surface is positioned has a closed distal end.

24. **(New)** The multilumen catheter of Claim 19, wherein the redirecting tip comprises a distal end having a generally hemispherical shape.

25. (New) The multilumen catheter of Claims 19, wherein the redirecting tip comprises a distal end having a generally parabolic profile.

26. (New) The multilumen catheter of Claim 19, further comprising a plurality of outlets in the side of the lumen wherein the surface is located.

27. (New) The multilumen catheter of Claim 26, where at least three outlets are provided in a side of the lumen wherein the surface is located.

28. (New) The multilumen catheter of Claim 26, wherein the outlets have a generally rectangular shape.

29. (New) The multilumen catheter of Claim 26, wherein a member extends between the catheter body and the redirecting tip between two adjacent outlets.

30. (New) The multilumen catheter of Claim 19, wherein the cross-sectional profile of the surface is substantially parabolic.

31. (New) The multilumen catheter of Claim 19, further comprising a radiopaque marker.

32. (New) A method of using the multilumen catheter of Claim 1, comprising the step of directing the catheter through a patient's vasculature, thereby permitting a user to draw blood through the second lumen and direct said blood into the first lumen.

33. (New) A method of using the multilumen catheter of Claim 2, comprising the step of directing the catheter through a patient's vasculature, thereby permitting a user to draw blood through the second lumen and direct said blood into the first lumen.

34. (New) A method of using the multilumen catheter of Claim 7, comprising the step of directing the catheter through a patient's vasculature, thereby permitting a user to draw blood through at least one of the second lumen and the third lumen and direct said blood into the first lumen.

Appl. No. : **10/078,283**
Filed : **February 14, 2002**

35. (New) A method of using the multilumen catheter of Claim 8, comprising the step of directing the catheter through a patient's vasculature, thereby permitting a user to draw blood through at least one of the second lumen, the third lumen, and the fourth lumen and direct said blood into the first lumen.